

Amendments to the Claims:

This listing of claims will replace all prior versions and listings of claims in the application.

Listing of Claims:

Claim 1 (currently amended): An apparatus for processing a semiconductor wafer, comprising:

- a. an upper element;
- b. a lower element, wherein the upper element and the lower element are configured to be brought together to form a processing volume; and
- c. a seal energizer configured to maintain the upper element against the lower element to maintain the processing volume by maintaining ~~within a selected range~~ a difference between a sealing force and a force generated within the processing volume within a range selected from a plurality of ranges, the force generated within the processing volume produced by a processing pressure that varies between a vacuum and a supercritical pressure.

Claim 2 (previously presented): The apparatus of claim 1, wherein the seal energizer is configured to minimize a non-negative net force against one of the upper element and the lower element above a threshold value, the net force following the equation $P1 \cdot A1 - P2 \cdot A2$, wherein $P1$ equals the sealing pressure, $P2$ equals a pressure generated within the processing volume, $A1$ equals a cross-sectional area of the seal-energizing cavity, and $A2$ equals a cross-sectional area of the processing volume.

Claim 3 (canceled)

Claim 4 (previously presented): The apparatus of claim 1, wherein the seal energizer comprises a first cavity and a seal-energizing cavity, the first cavity coupled to the seal-energizing cavity, the seal energizer configured so that a first pressure generated within the first cavity generates a second pressure in the seal-energizing cavity larger than the first pressure.

Claim 5 (original): The apparatus of claim 2, wherein the cross-sectional area $A1$ is larger than the cross-sectional area $A2$.

Claim 6 (original): The apparatus of claim 1, further comprising a means for generating supercritical conditions coupled to the processing volume.

Claim 7 (original): The apparatus of claim 6, further comprising a CO₂ supply vessel coupled to the processing volume.

Claim 8 (original): The apparatus of claim 1, wherein the upper element and the lower element form a supercritical processing chamber.

Claim 9 (original): The apparatus of claim 1, wherein the seal energizer comprises a hydraulic piston coupled to the lower element and configured to maintain the processing volume.

Claim 10 (currently amended): An apparatus for processing a semiconductor wafer, comprising:

- a. an upper element;
- b. a lower element, wherein the upper element and the lower element are configured to be brought together to form a processing volume; and
- c. means for non-linearly varying a sealing pressure to maintain maintaining a seal between the upper element and the lower element to maintain the processing volume by maintaining within a selected range a difference between a sealing force and a force generated within the processing volume, thereby maintaining the processing volume, wherein the force generated within the processing volume is produced by a processing pressure that varies between a vacuum and a supercritical pressure.

Claim 11 (withdrawn): A method of maintaining a processing volume, the method comprising the steps of:

- a. generating a processing pressure within a processing volume; and
- b. controlling a sealing pressure to form and maintain a processing volume, wherein during a processing cycle the sealing pressure is varied non-linearly with the processing pressure.

Claim 12 (withdrawn): The method of claim 11, wherein the sealing pressure is related to the processing pressure by the equation $\Delta F = P1 * A1 - P2 * A2$, wherein P1 equals the sealing pressure, P2 equals the processing pressure, A1 equals a cross-sectional area of a seal-energizing cavity, and A2 equals a cross-sectional area of a processing volume, and the sealing pressure is varied to maintain ΔF above a threshold value.

Claim 13 (withdrawn): The method of claim 12, wherein a cross-sectional area of the processing volume is smaller than a cross-sectional area of the seal-energizing cavity.

Claim 14 (withdrawn): The method of claim 11, wherein the step of generating a processing pressure comprises containing a high-pressure processing fluid in the processing volume.

Claim 15 (withdrawn): The method of claim 14, wherein the high-pressure processing fluid comprises supercritical carbon dioxide.

Claim 16 (withdrawn): The method of claim 12, wherein the step of controlling a sealing pressure comprises generating a hydraulic pressure in the seal-energizing cavity.

Claim 17 (previously presented): The apparatus of claim 1, wherein the sealing force is generated by a sealing pressure that varies non-linearly with a pressure generated within the processing volume.

Claim 18 (previously presented): The apparatus of claim 1, wherein the seal energizer comprises a controller for determining a sealing pressure from a pressure generated within the processing volume and the selected range.

Claim 19 (previously presented): The apparatus of claim 1, wherein a lower bound of the selected range includes a minimum force for maintaining the processing volume.

Claim 20 (previously presented): The apparatus of claim 19, wherein the minimum force is based on a delay between generating the sealing force and generating the force within the processing volume.

Claim 21 (previously presented): The apparatus of claim 1, wherein the force generated within the processing volume varies during a processing cycle.

Claim 22 (currently amended): An apparatus for processing a semiconductor wafer, comprising:

- a. a processing chamber comprising a processing volume for processing the semiconductor wafer by generating a variable processing pressure; and
- b. means for maintaining the processing volume by determining the variable processing pressure and generating a sealing pressure that varies non-linearly with the processing pressure, wherein the variable processing pressure varies between a vacuum and a supercritical pressure.

Claim 23 (new): An apparatus for processing a semiconductor wafer, comprising:

- a. a processing chamber comprising a processing volume for processing the semiconductor wafer by generating a variable processing pressure; and
- b. a seal energizer configured to maintain the processing volume by maintaining a difference between a sealing force and a force generated within the processing volume within a range, wherein the range is independent of pressures generated within the processing volume and the pressures generated within the processing volume vary between a vacuum and a supercritical pressure.

Claim 24 (new): The apparatus of claim 23, further comprising a controller configured to follow an algorithm to determine the sealing force, the algorithm accounting for non-linear variations between the sealing force, the force generated within the processing volume, and the difference between the sealing force and the force generated within the processing volume.